

FIG. 1

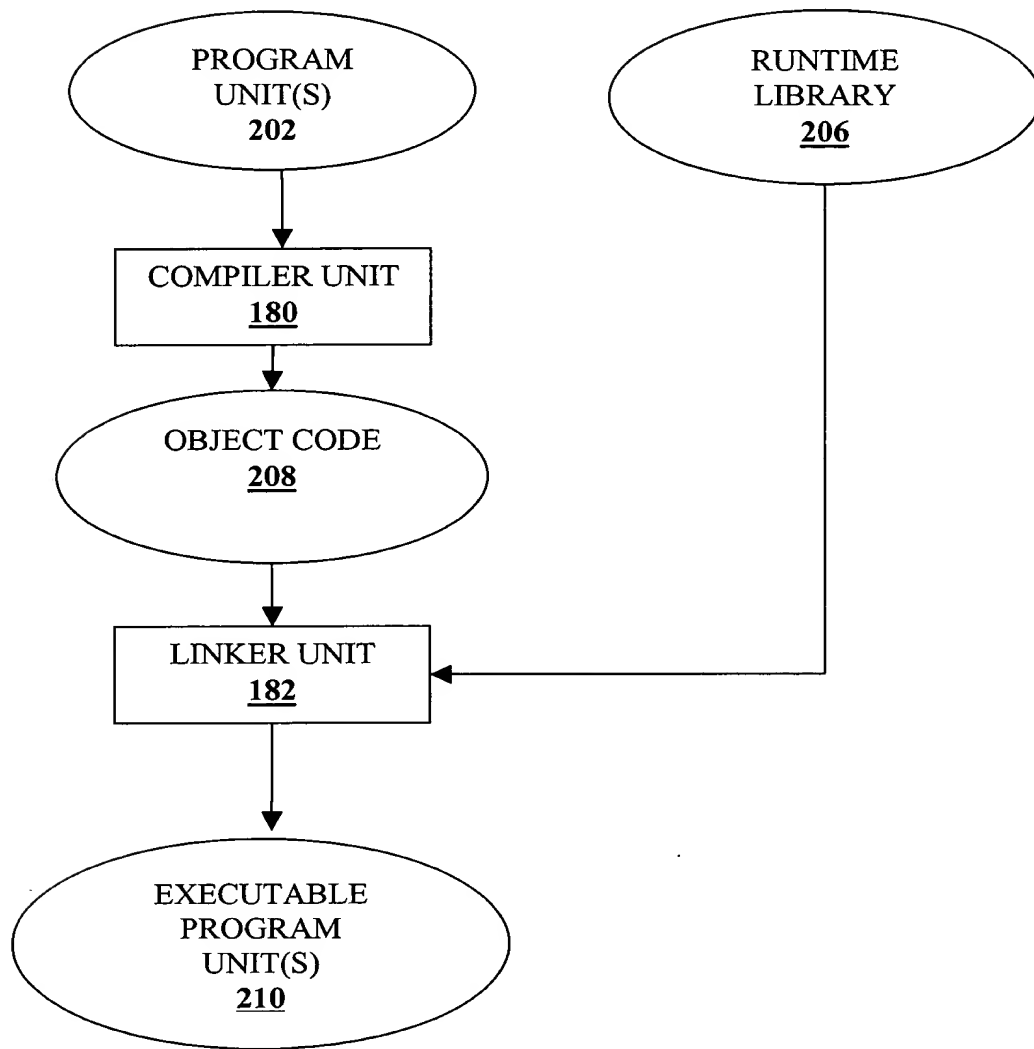


FIG. 2

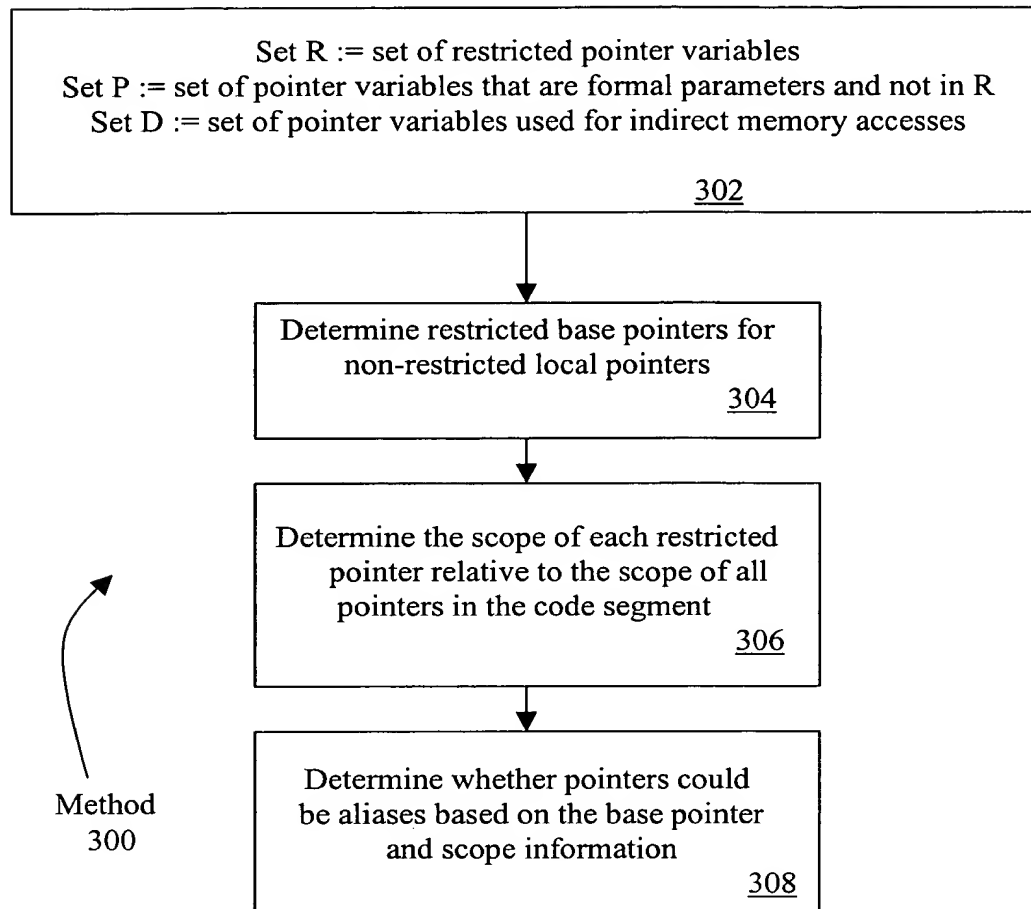


FIG. 3

Program 400

```
410 void bar( float * restrict a, float * x, int i, int j, int k ) {  
415   a[0] = x[0];  
420   {  
425     float * restrict b = a-k;  
430     float * restrict c = x+k;  
435     float * y = b+i;  
440     c[i] = *y;  
445   }  
450   {  
455     float * restrict d = a;  
460     {  
470       float * restrict e = x;  
475       d[j] = e[j];  
480     }  
490   }  
495 }
```

FIG. 4

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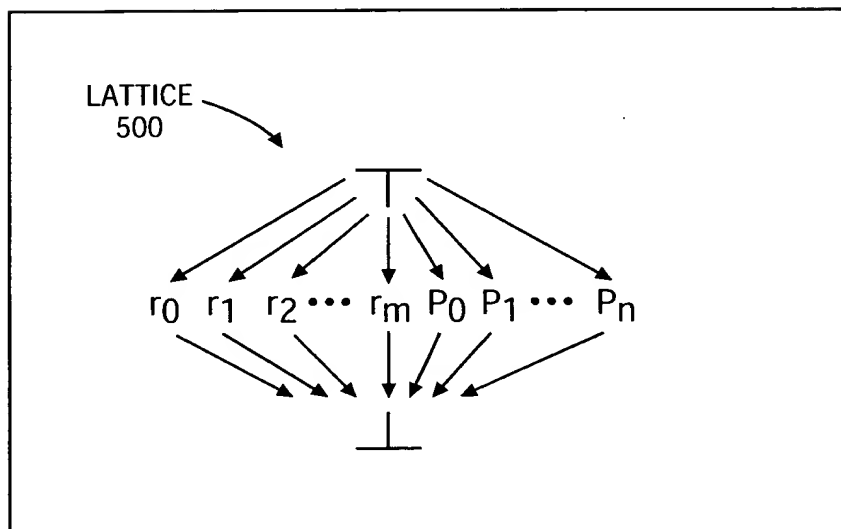


FIG. 5

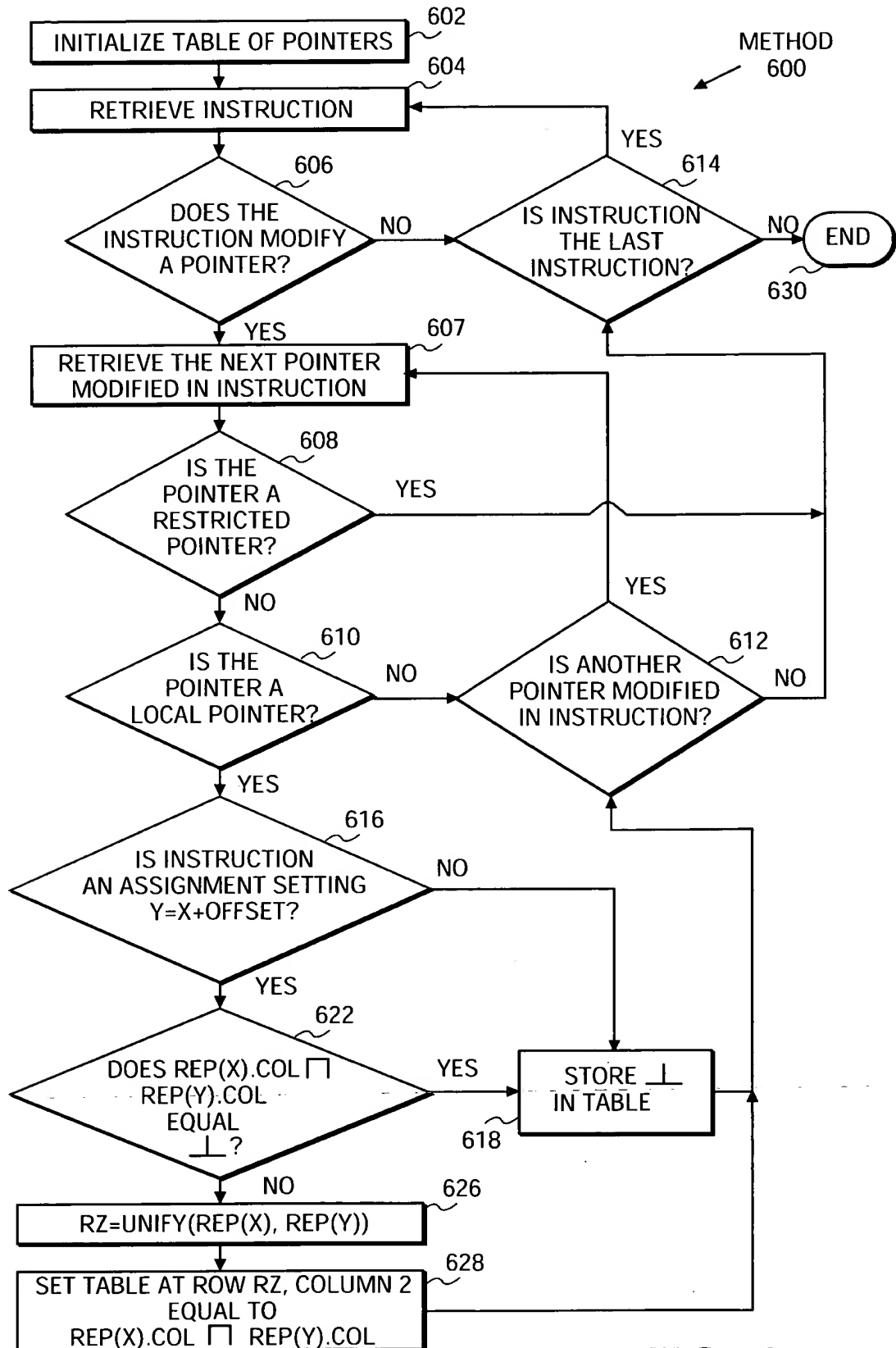


FIG. 6

procedure FLOW_WALK

```

702 for each pointer variable w do
704   if w ∈ (R ∪ P) then
706     REP(w).col = w;
708   else
710     REP(w).col = T;
712   enddo
702
    
```

```


714 for each instruction do
716   for each pointer variable y that might be modified by the instruction
718     if y is pointer variable that is restrict qualified then
720       //Ignore it.
722     else
724       if y is a local pointer variable then
726         if instruction is assignment that sets y to adjustment of x then
728           if REP(x).col ∩ REP(y).col = ⊥ then
730             // Do not unify. Doing so just loses information.
732             REP(y).col = ⊥
734           else
736             //Target of y is same as target of x
738             rz = UNIFY(REP(y), REP(x) );
740             rz.col = REP(x).col ∩ REP(y).col;
742           endif
744         else
746           //Target of y is unknown
748           REP(y).col := ⊥;
750         endif
752       endif
756     enddo
758   enddo

760 end FLOW_WALK
704
    
```

Pseudo Code 700

FIG. 7

Table 800



Pointer	REP(...).col
a	a
b	b
c	c
d	d
e	e
x	x
y	b

FIG. 8



procedure SCOPE_WALK

```
1010 for each i in D do
1015   for each j in R do
1020     MATRIX[ROW(i),j] := true;
1025   enddo
1030 enddo 1002
```

```
1035 for each instruction x do
1040   for each indirect read or write through a pointer y do
1045     i := ROW(y);
1050     k := REP(y).col;
1055     if  $k \in (R \cup P)$  then
1060       for each j in R do
1065         if j is not in scope when instruction x executes then
1070           MATRIX[i,j] := false;
1075         endif
1080       enddo
1090     enddo
1095   enddo
1096 enddo 1004
```

end SCOPE_WALK

Pseudo Code 1000

FIG. 10

	a	b	c	d	e
a		x	x	x	x
b				x	x
c				x	x
d		x	x		
e		x	x		
x		x	x	x	x
y				x	x

Matrix 1100

FIG. 11

METHOD
1200

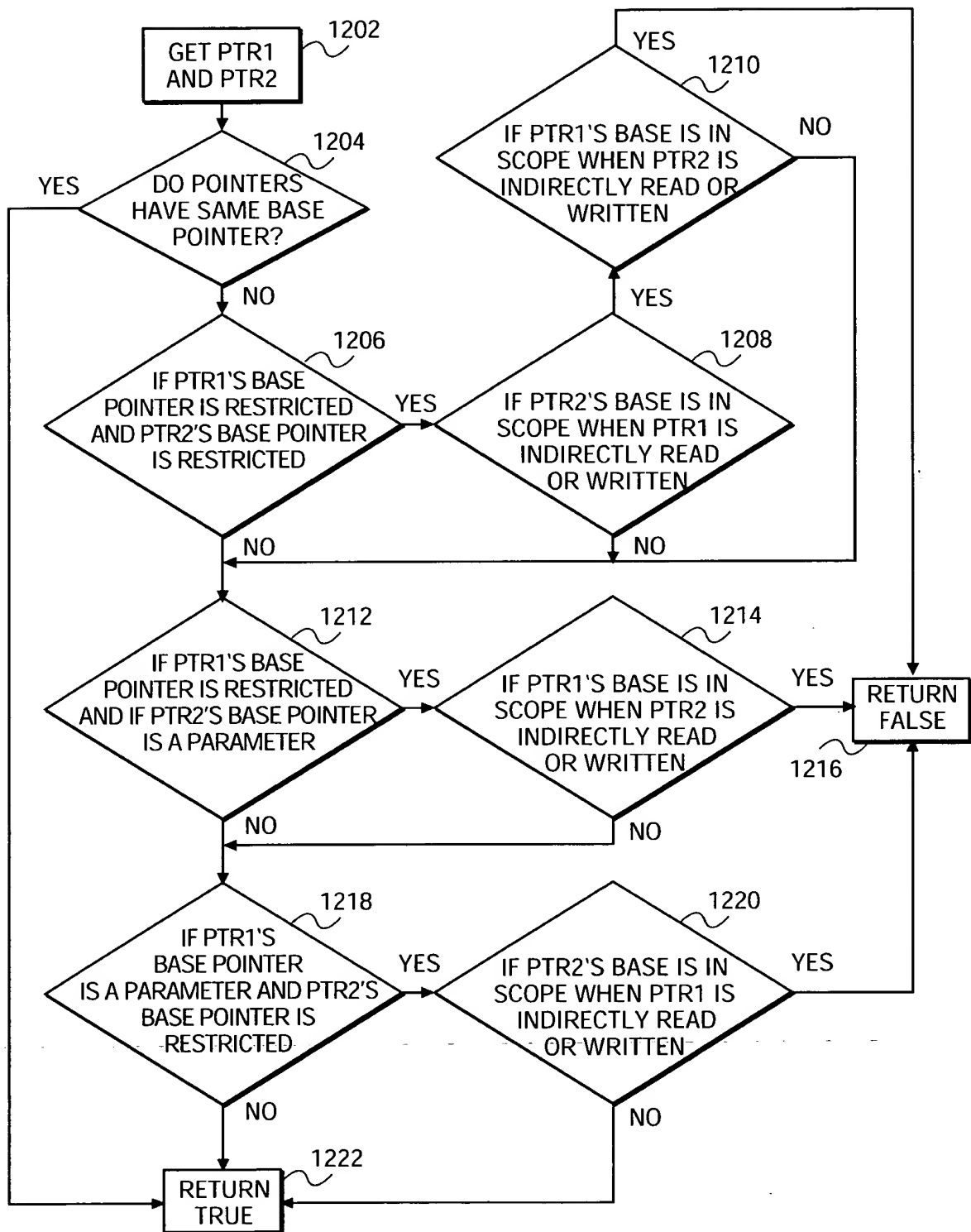


FIG. 12

Pseudo Code 1300

procedure COULD_TARGETS_ALIAS(x,y)

```
1320 i = REP(x).col;  
1302 j = REP(y).col;  
1306 if i=j then  
1308   return true;  
1310 endif 1302
```

```
1312 if i∈R and j∈R and MATRIX[ROW(x),j]=true  
1314 and MATRIX[ROW(y),i]=true then  
1316   return false;  
1318 endif 1304
```

```
1320 if i∈R and j∈P and MATRIX[ROW(y),i]=true then  
1322   return false;  
1324 endif 1306
```

```
1326 if j∈R and i∈P and MATRIX[ROW(x),j]=true then  
1328   returns false;  
1330 endif  
1340 return true; 1308
```

end COULD_TARGETS_ALIAS

FIG. 13